

| Mode | Data rate (Mbps) | Target application | Receiver sensitivity | Power consumption ('2001) | |
|----------------------|------------------|--------------------------|----------------------|---------------------------|--------------|
| | | | | Rx. average | Tx. average |
| Mode 1.0 (Bluetooth) | 1 Mbps | | -84 dBm | 25 <i>mW</i> | 15 <i>mW</i> |
| Mode 2.0 | 2.6-3.9 Mbps | Audio | -78 dBm | 30 <i>mW</i> | 20 <i>mW</i> |
| Mode 3.0 | 22-44 Mbps | Video, computer graphics | -69 dBm | 95 <i>mW</i> | 60 <i>mW</i> |

Figure 1

0977201-02001
T05020 T022260

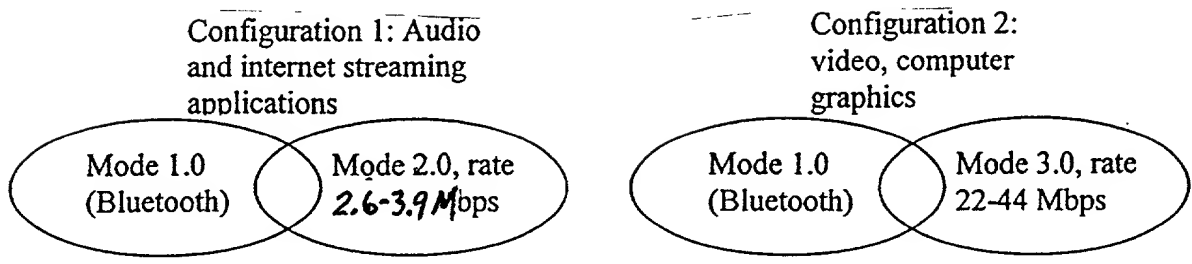


Figure 2

| Parameters | Mode 1 (Bluetooth) | Mode 2 |
|---------------------------|--------------------|---|
| Frequency hopping | 1600 Hz | Same as Bluetooth |
| Filter spectrum | | Same as Bluetooth 1600 Hz |
| Modulation | GFSK | 16, 64 QAM |
| Maximum data rate | 1 Mbps | 2.6, 3.9 Mbps |
| Acquisition | | Using mode 1 then switch to mode 2 |
| Transmit power | 0 dBm | 0 dBm, 6 dBm |
| Distance | 10 m. | 10 m. |
| Nominal packet error rate | 10 % | 10 % |
| Margin + Noise figure | 37 dB | 37 dB |
| Receiver sensitivity | -84 dBm | -84, -78 dBm |
| Coding | ARQ | ARQ + convolutional code across packets |

Figure 3

| Frequency offset | Transmit power |
|------------------|----------------|
| +/- 550 kHz | -20 dBc |
| $ M-N = 2$ | -20 dBm |
| $ M-N \geq 3$ | -40 dBm |

Figure 4

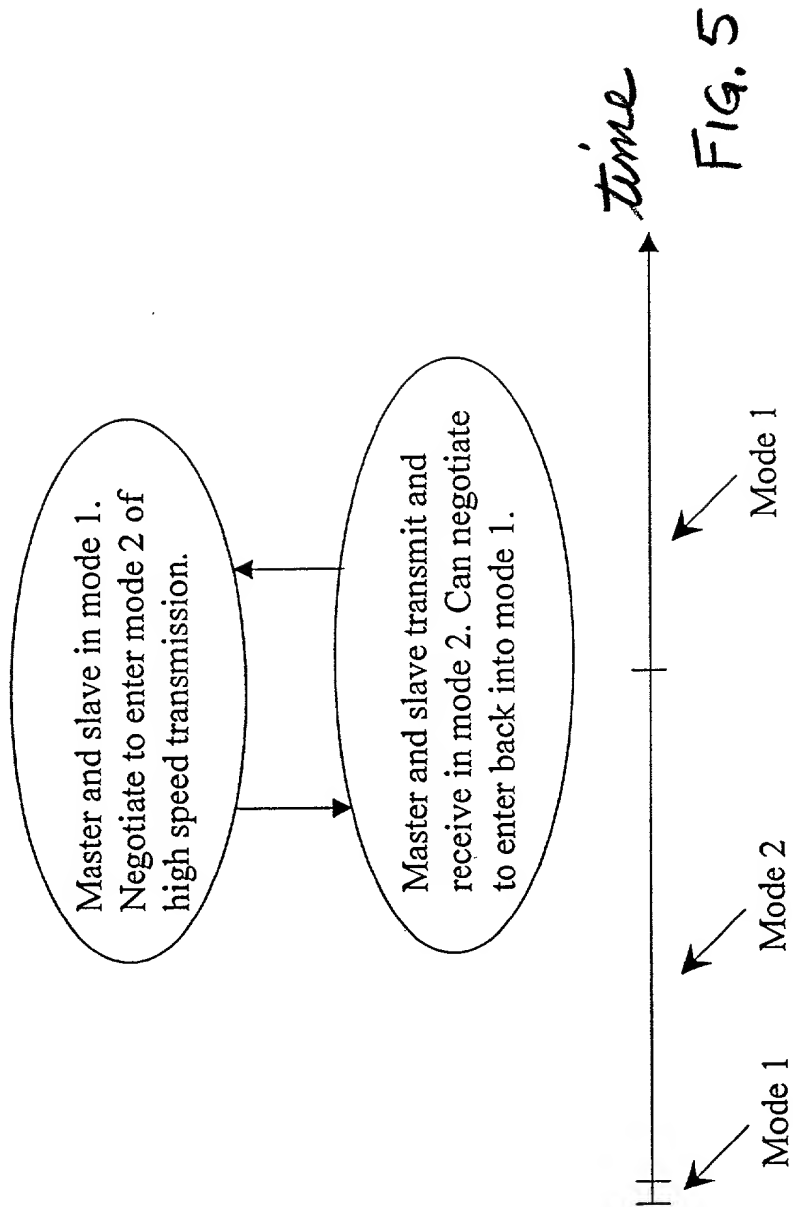


FIG. 5

0977201.02004
T05020" T02260

| LSB | 20 symb. | 32 symb. | 27 symb. | 0-1780 symb. | MSB |
|-----|-----------------------------|-------------------------------|---------------------------|---|-----|
| | Preamble 30.8 μ sec. | Sync. Word 49.2 μ sec. | Header 41.5 μ sec. | Payload 0-2738 μ sec. | |
| | 20 bits | 64 bits | 54 bits | 0-7120 bits for 16 QAM 0-10680 bits for 64 QAM | |

Figure 6

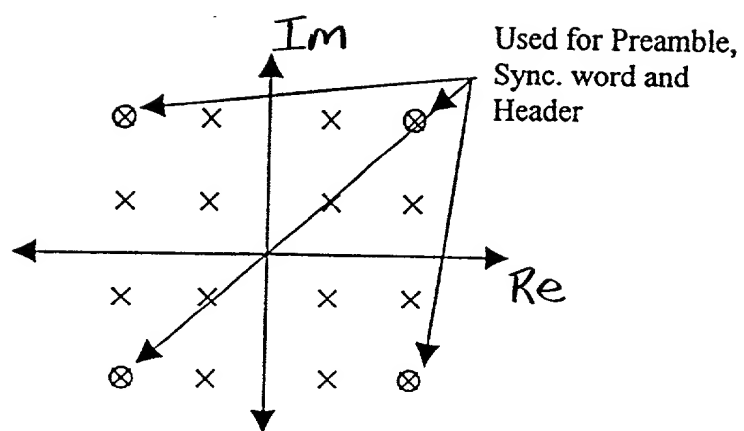


Figure 6A

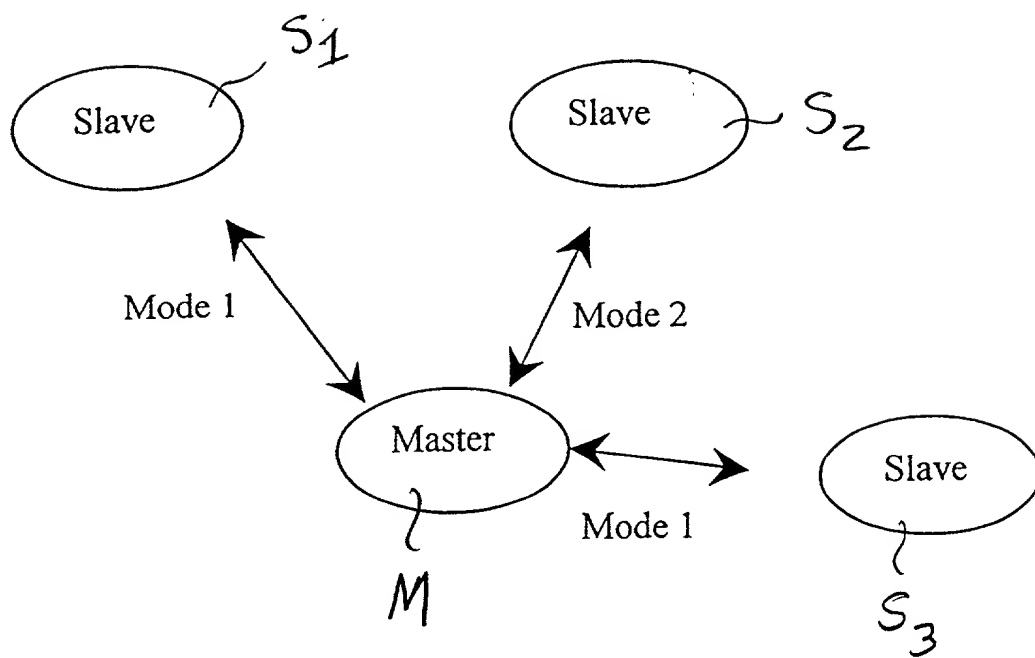


Figure 7

0977301-02661
T09020-T022265

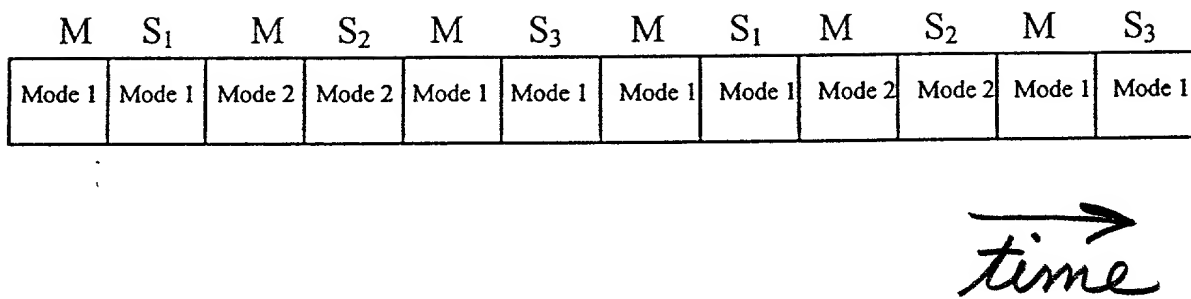


Figure 8

0977201-020501
T05020 T02260

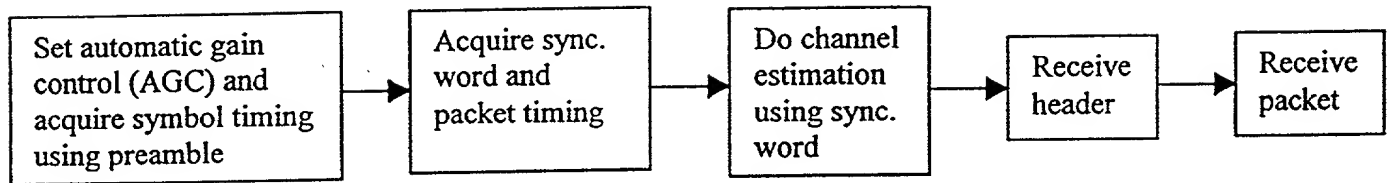


Figure 9

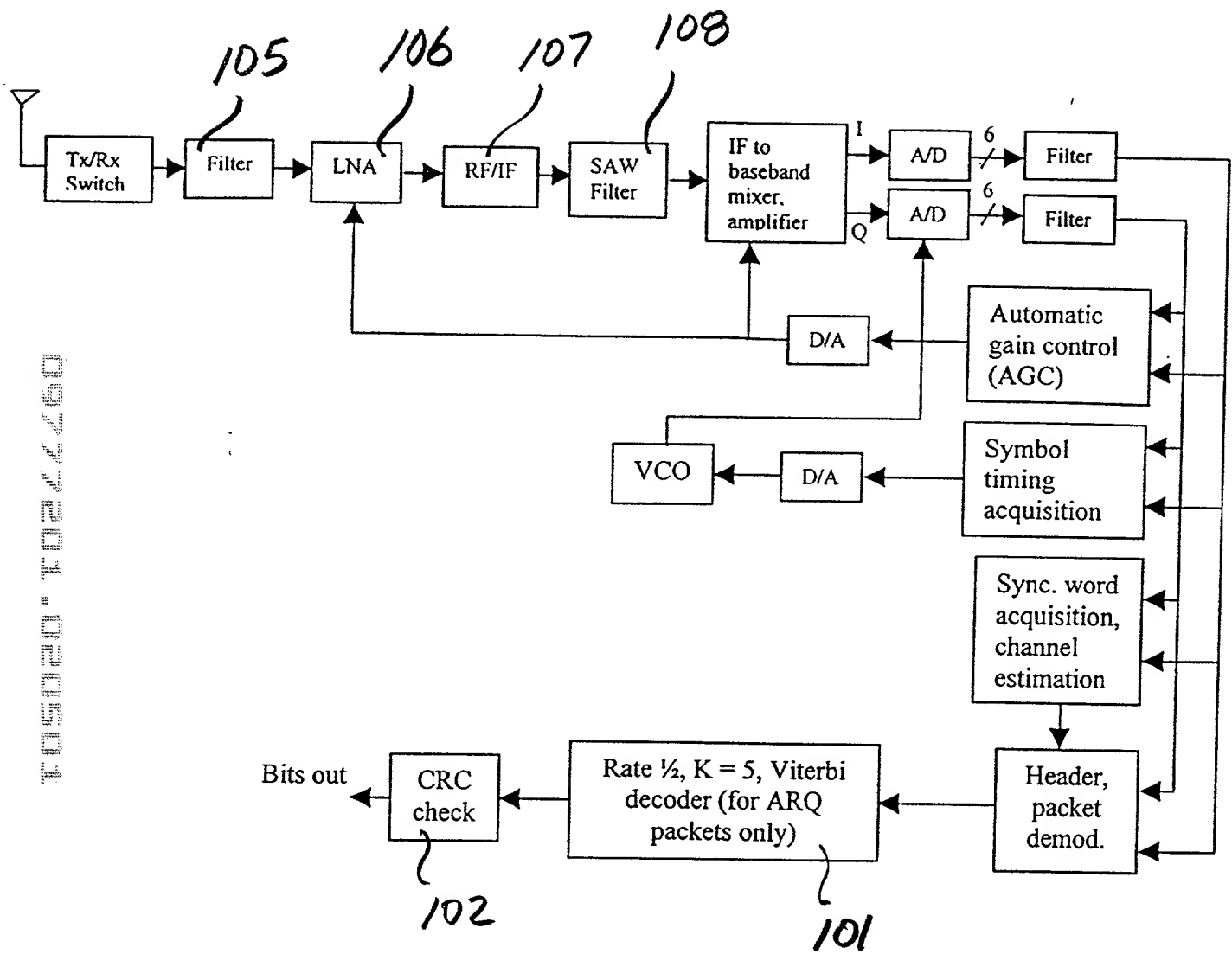


Figure 10

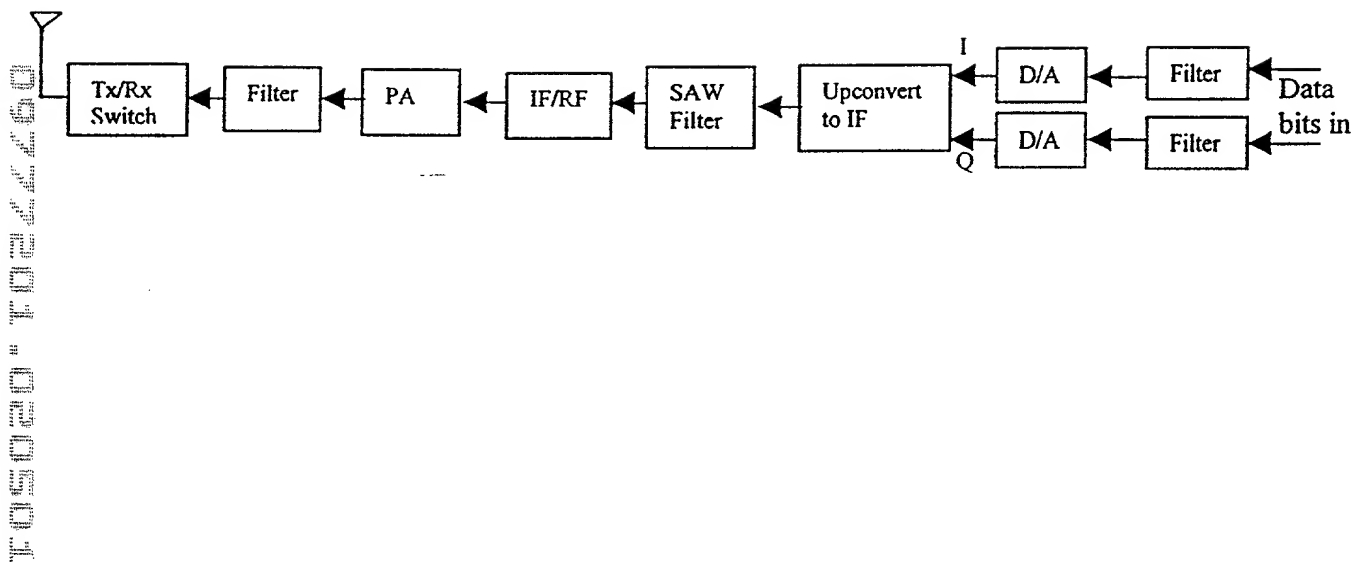


Figure 11

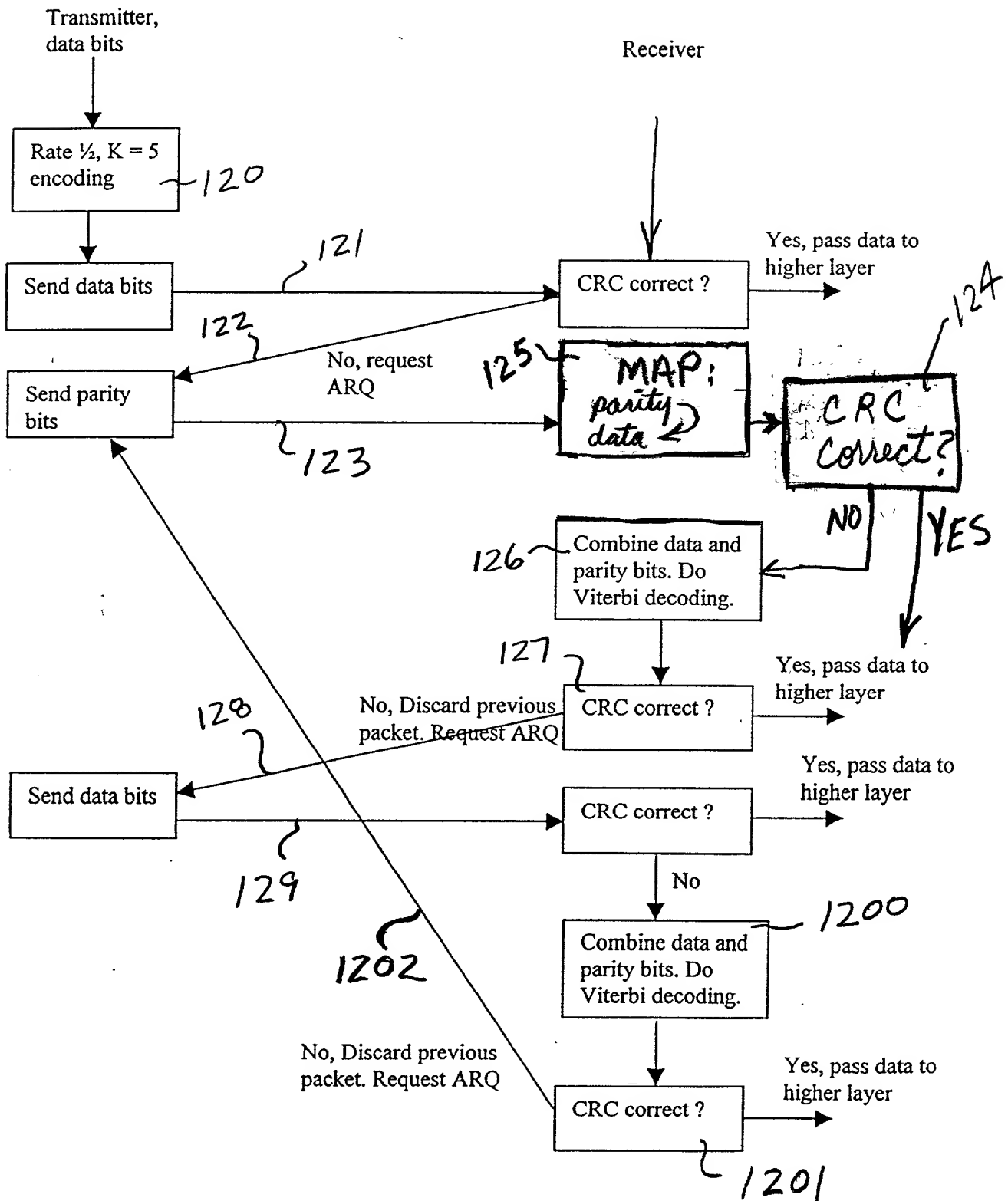


Figure 12

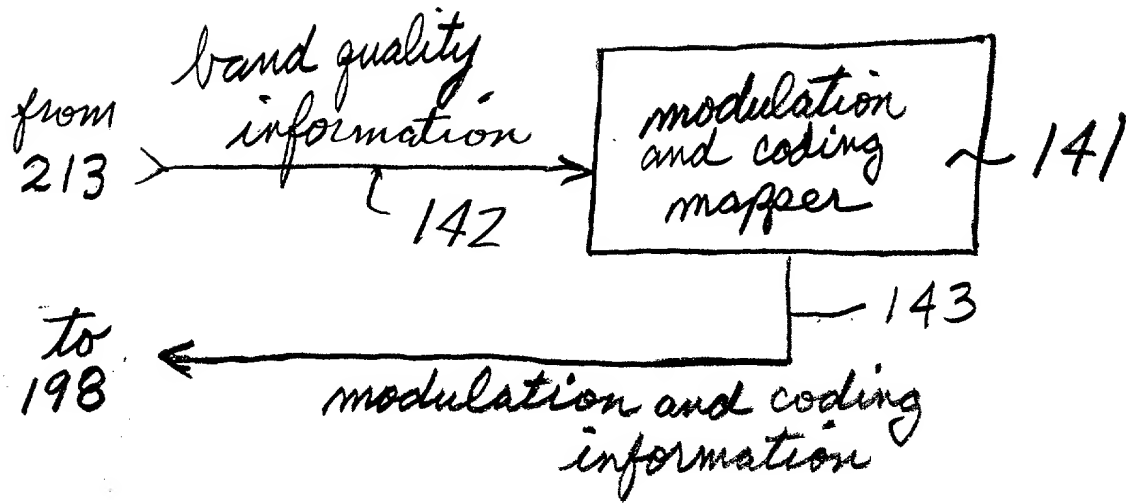


FIG. 14B

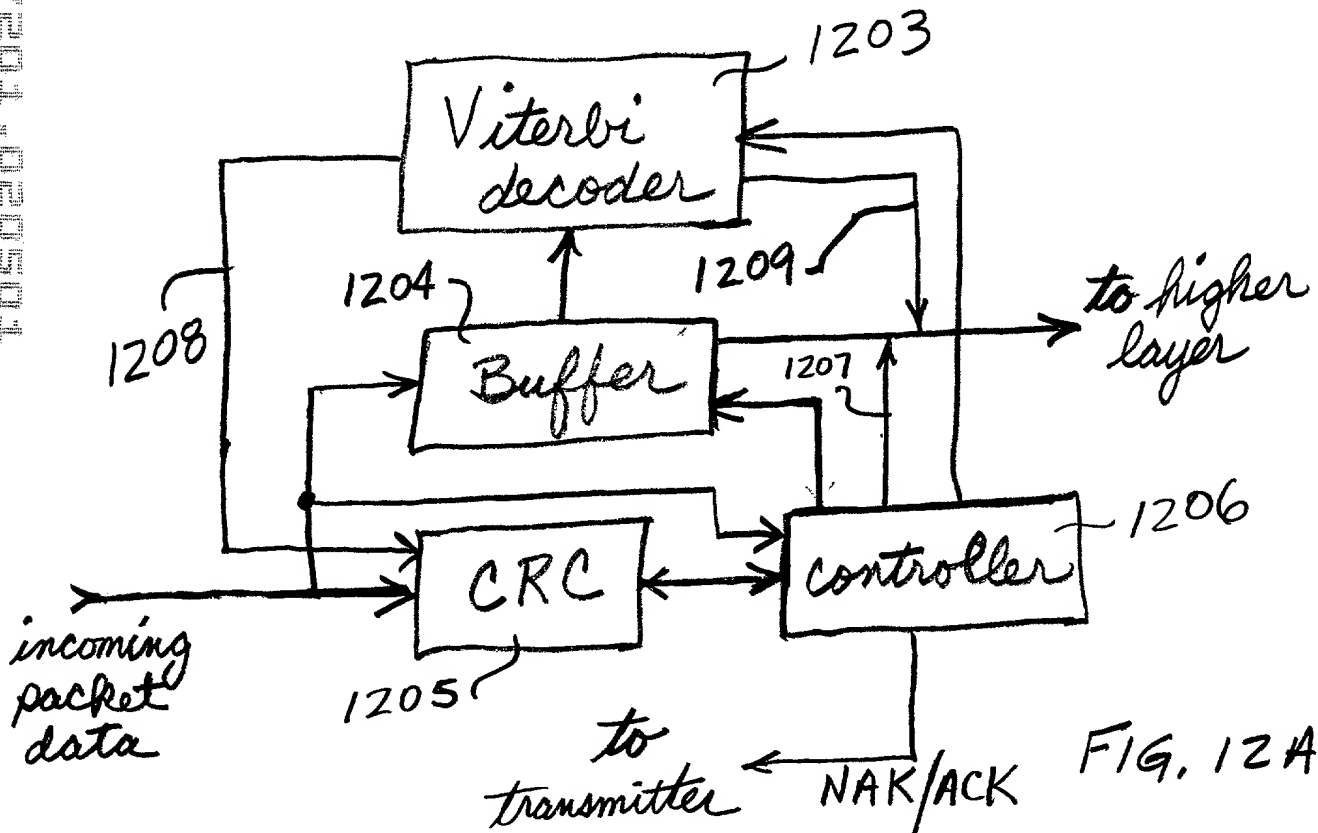
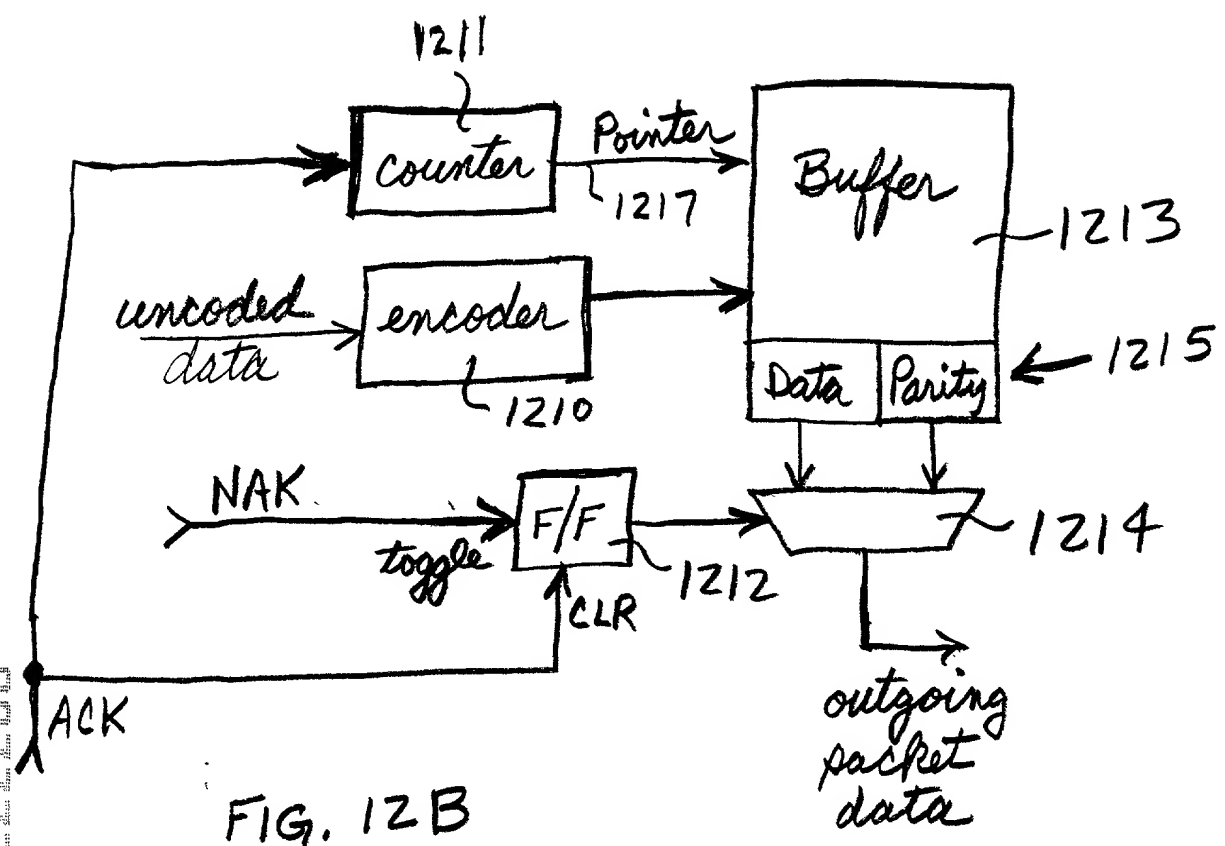


FIG. 12A

09777201.020501



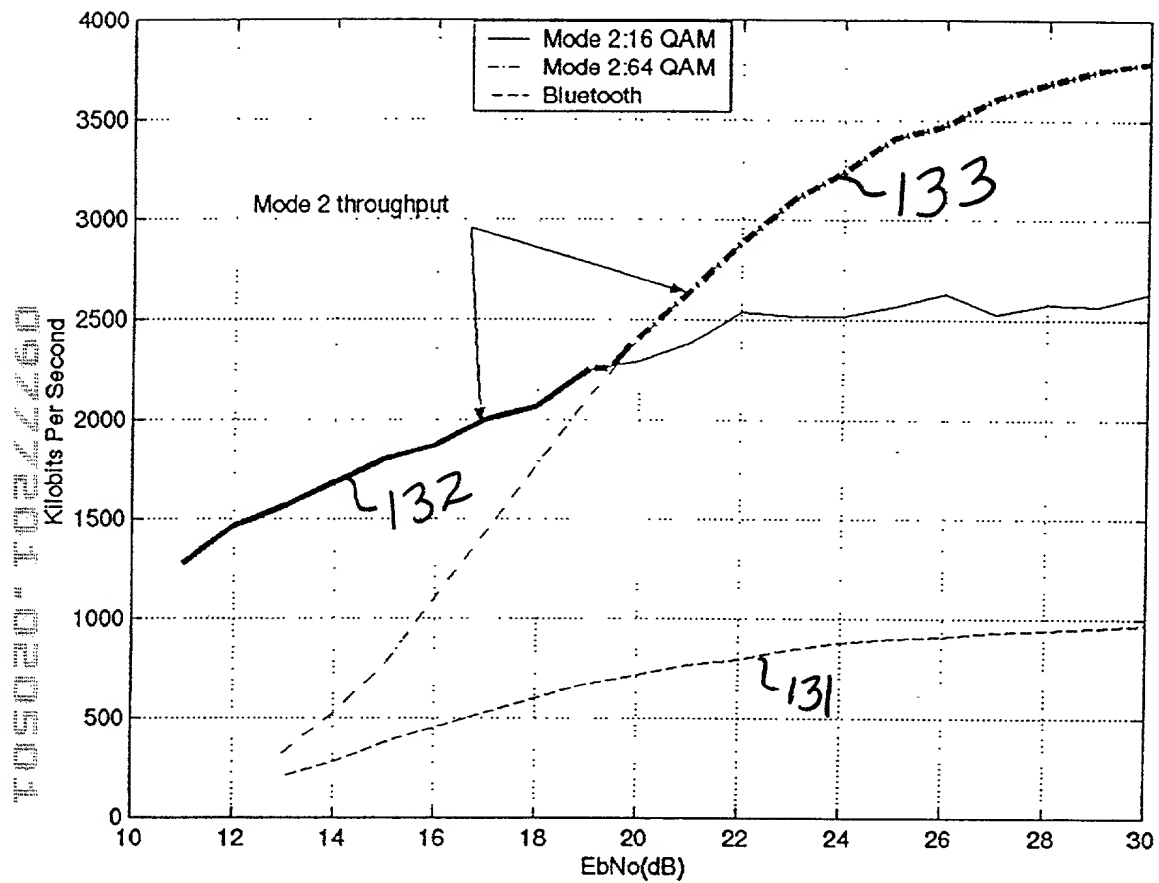


Figure 13

| Parameters | 1 | 2 | 3 | 4 | 5 |
|------------------------|------------------------|----------------|------------------------|------------------------|----------------|
| Filter spectrum | 802.11b | 802.11b | 802.11b | 802.11b | 802.11b |
| Modulation | QPSK | QPSK | 16 QAM | 16 QAM | 16 QAM |
| Scrambling code length | 256 | 256 | 256 | 256 | 256 |
| Physical data rate | 22 Mbps | 22 Mbps | 44 Mbps | 44 Mbps | 44 Mbps |
| Coding | Rate 1/2, Turbo (SCCC) | None | Rate 1/2, Turbo (SCCC) | Rate 3/4, Turbo (SCCC) | None |
| ARQ | Optional | Optional | Optional | Optional | Optional |
| Maximum data rate | 11 Mbps | 22 Mbps | 22 Mbps | 33 Mbps | 44 Mbps |
| Transmit power | -1 dBm | 8 dBm | 4 dBm | 8 dBm | 15 dBm |
| Distance | 10 m. | 10 m. | 10 m. | 10 m. | 10 m. |
| Bit error rate | 1e-8 | 1e-8 | 1e-8 | 1e-8 | 1e-8 |
| Packet error rate | 1e-4 | 1e-4 | 1e-4 | 1e-4 | 1e-4 |
| Margin+Noise figure | 37 dB | 37 dB | 37 dB | 37 dB | 37 dB |
| Receiver sensitivity | -85 dBm | -76 dBm | -80 dBm | -76 dBm | -69 dBm |
| Frequency diversity | Band selection | Band selection | Band selection | Band selection | Band selection |
| SYMBOL RATE | 11 Msps | 11 Msps | 11 Msps | 11 Msps | 11 Msps |
| SPREADING | 11 Mcps | 11 Mcps | 11 Mcps | 11 Mcps | 11 Mcps |

Figure 14

| | Max. data rate | Modulation | Symbol rate | Coding | Spreading |
|----|-------------------|------------|-------------|----------|---------------|
| 18 | 18 Mbps | QPSK | 18 Msps | rate 1/2 | 18 Mchips/sec |
| 19 | 36 Mbps | QPSK | 18 Msps | rate 1 | 18 Mchips/sec |
| 20 | 36 Mbps | 16 QAM | 18 Msps | rate 1/2 | 18 Mchips/sec |
| 21 | 54 Mbps | 16 QAM | 18 Msps | rate 3/4 | 18 Mchips/sec |
| 22 | 72 Mbps | 16 QAM | 18Msps | rate 1 | 18 Mchips/sec |
| | | | | | |

FIG. 14A

| Parameters | 6 | 7 | 8 | 9 | 10 |
|------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Filter spectrum | 802.11b | 802.11b | 802.11b | 802.11b | 802.11b |
| Modulation | QPSK | QPSK | QPSK | QPSK | QPSK |
| Scrambling code length | 256 | 256 | 256 | 256 | 256 |
| Physical data rate | 22 Mbps | 22 Mbps | 22 Mbps | 22 Mbps | 22 Mbps |
| Coding | Rate 1/2, Turbo | Rate 2/3, Turbo | Rate 3/4, Turbo | Rate 4/5, Turbo | Rate 5/6, Turbo |
| ARQ | Optional | Optional | Optional | Optional | Optional |
| Maximum data rate | 11 Mbps | 14.67 Mbps | 16.5 Mbps | 17.6 Mbps | 18.33 Mbps |

FIG. 14C

FIG. 14C

| Parameters | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|------------------------|----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Filter spectrum | 802.11b | 802.11b | 802.11b | 802.11b | 802.11b | 802.11b | 802.11b |
| Modulation | 8-PSK | 8-PSK | 8-PSK | 8-PSK | 8-PSK | 8-PSK | 8-PSK |
| Scrambling code length | 256 | 256 | 256 | 256 | 256 | 256 | 256 |
| Physical data rate | 33 Mbps | 33 Mbps | 33 Mbps | 33 Mbps | 33 Mbps | 33 Mbps | 33 Mbps |
| Coding | None | Rate 1/3, Turbo | Rate 1/2, Turbo | Rate 2/3, Turbo | Rate 3/4, Turbo | Rate 4/5, Turbo | Rate 5/6, Turbo |
| ARQ | Optional | Optional | Optional | Optional | Optional | Optional | Optional |
| Maximum data rate | 33 Mbps | 11 Mbps | 16.5 Mbps | 22 Mbps | 24.75 Mbps | 26.4 Mbps | 27.5 Mbps |

FIG. 14D

0977201-020501
T05020-T027260

| Frequency offset | Transmit power |
|---------------------|----------------|
| f_c | 0 dBc |
| $\pm 11\text{MHz}$ | -30 dBc |
| $\pm 22\text{ MHz}$ | -50 dBm |

Figure 15

105020" 1024450

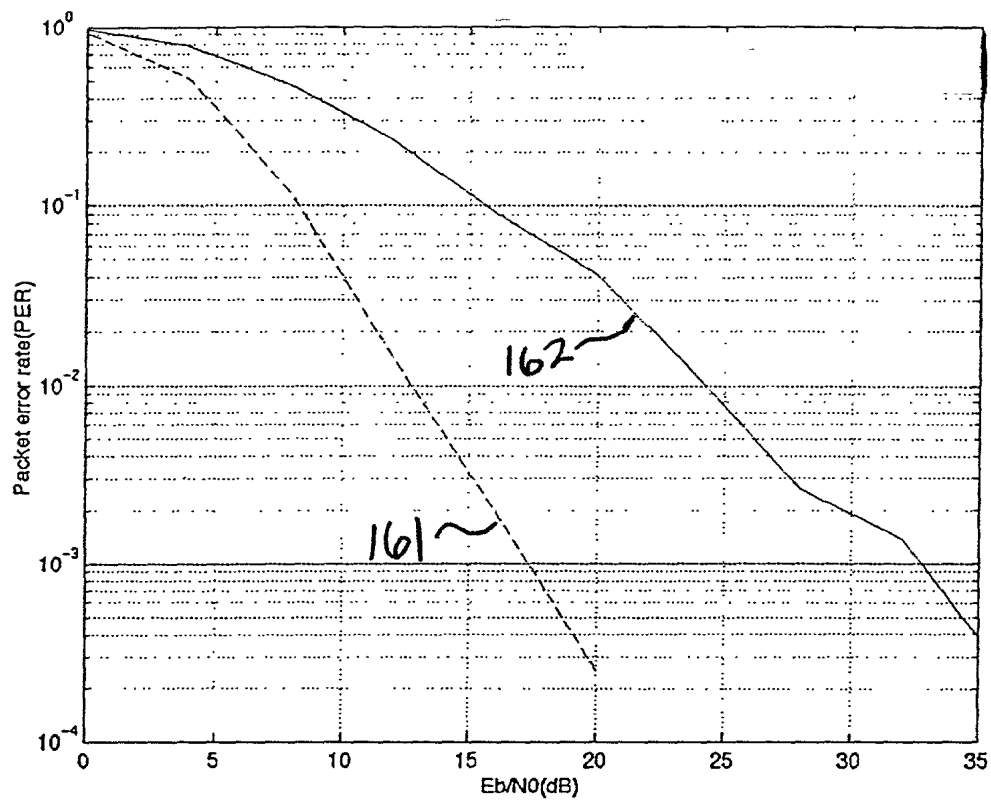


Figure 16

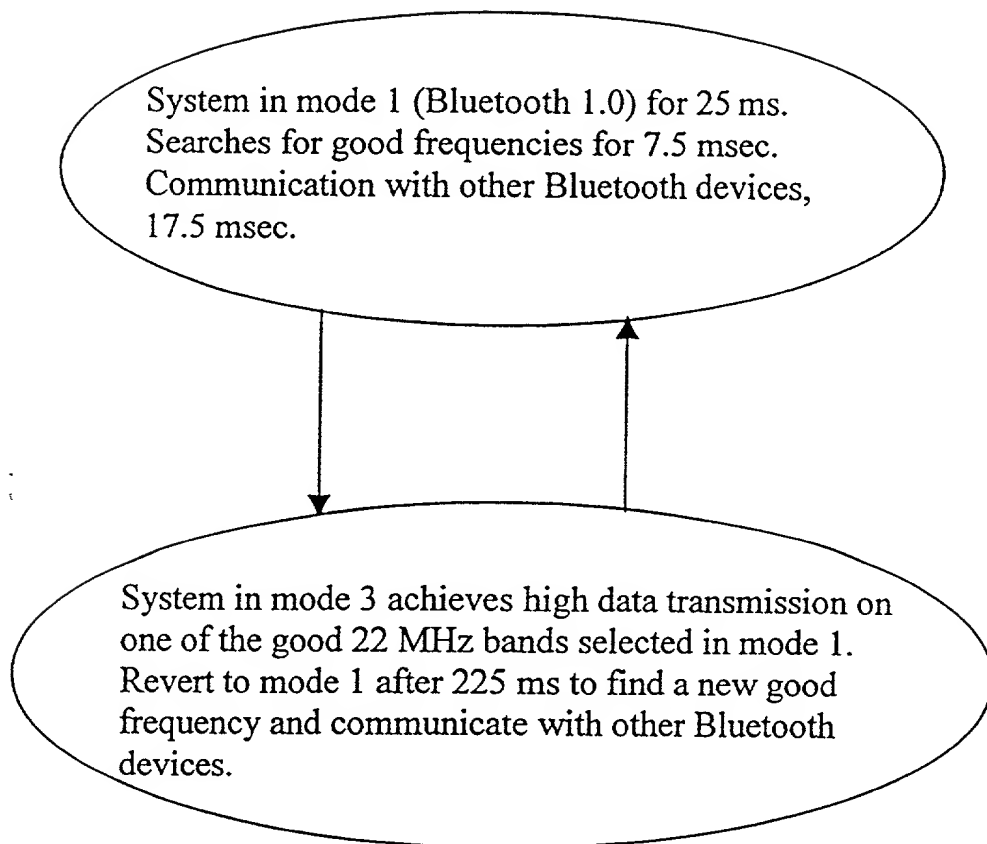


Figure 17

0977201-020501
T05020 T022260

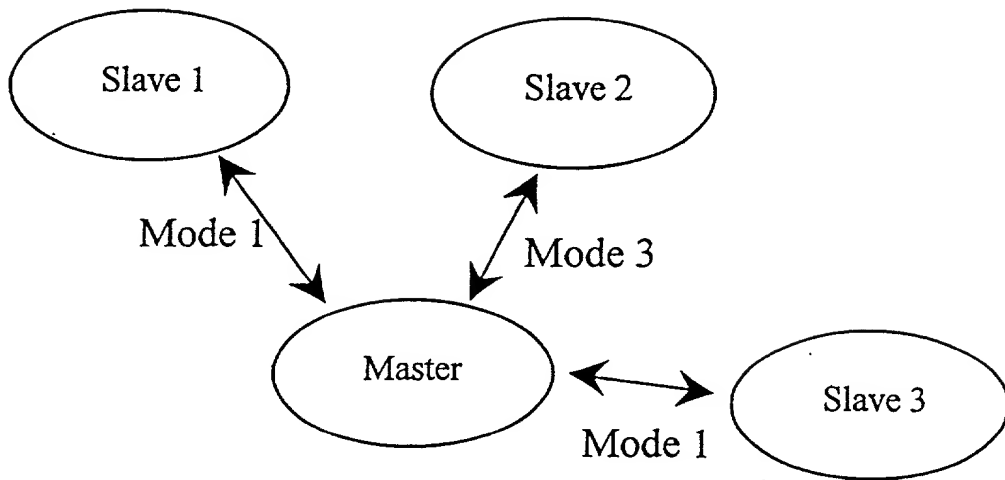


Figure 18

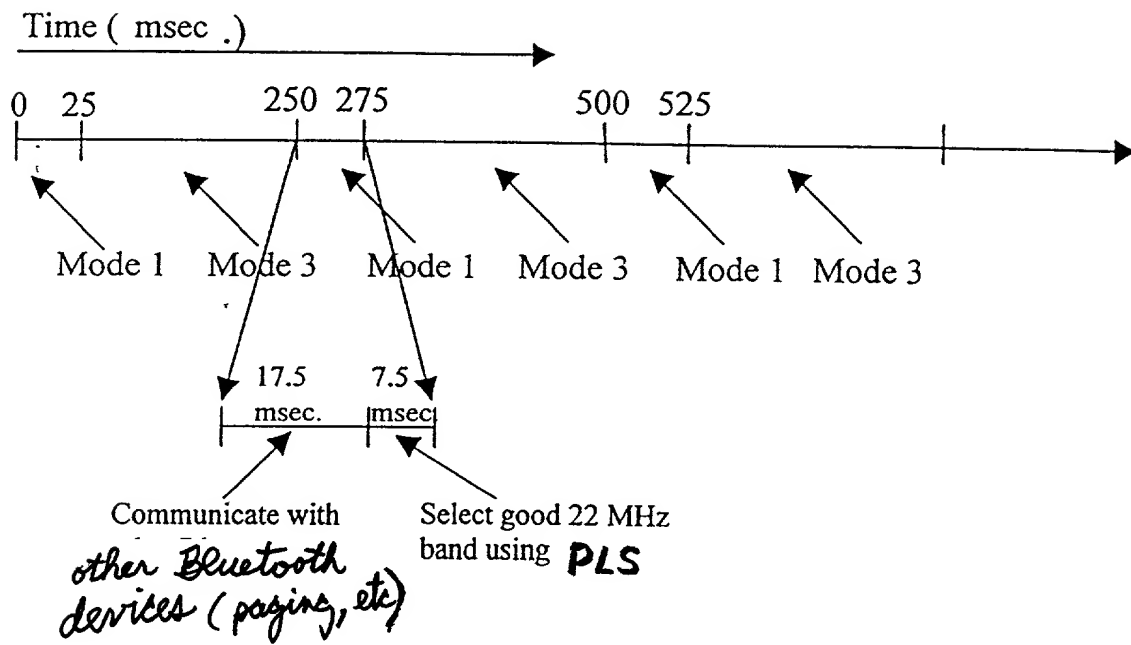
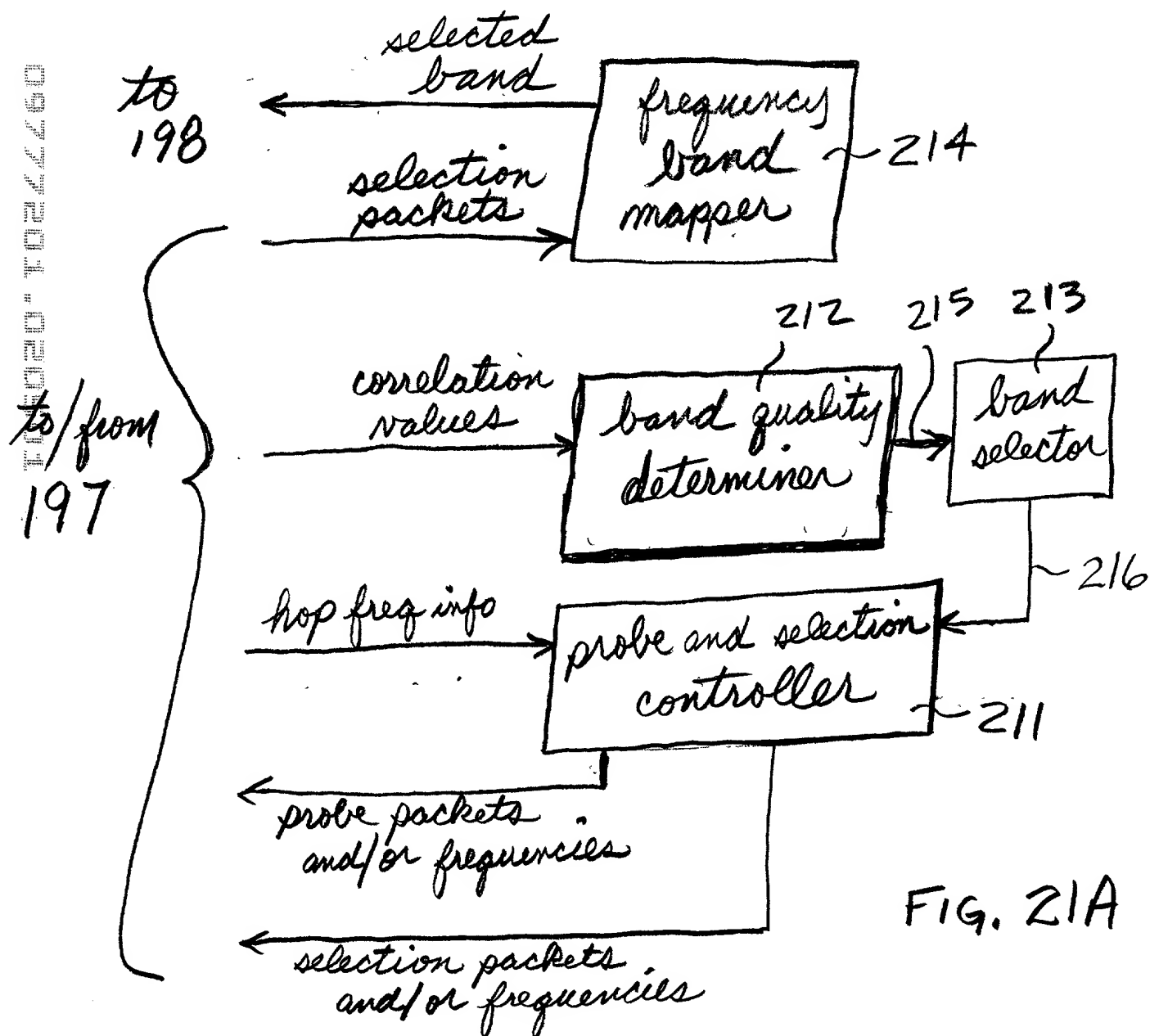
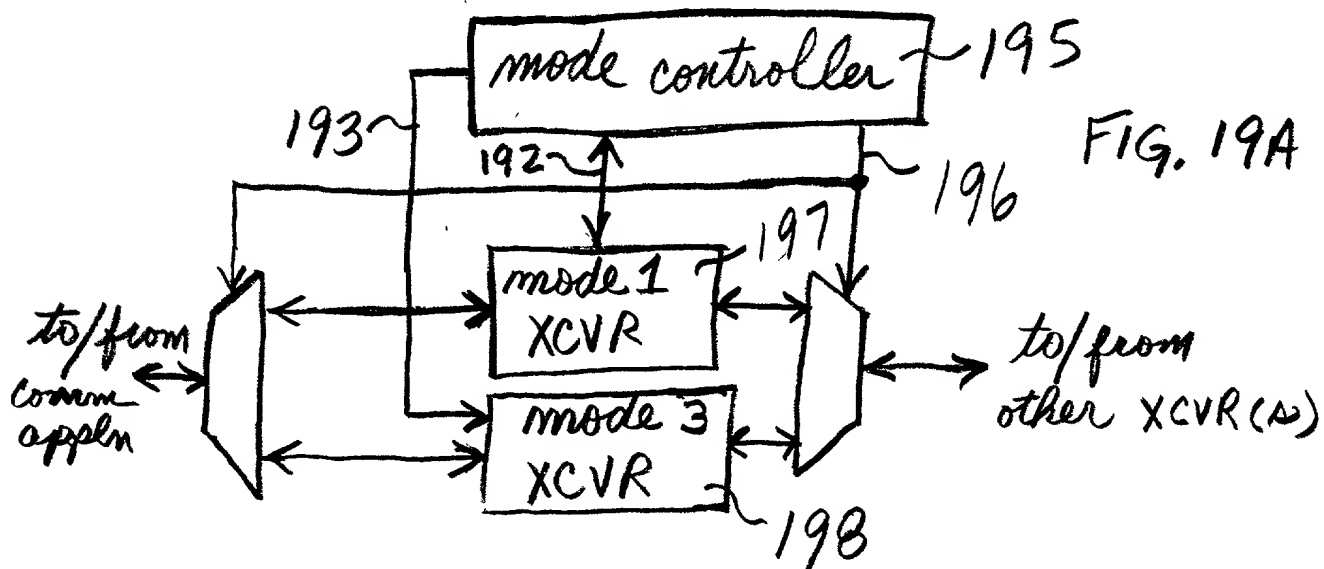


Figure 19



0977201-020501

| | |
|--------------------|------------------------|
| Preamble 4 bits | Access Code 64 bits |
|--------------------|------------------------|

Figure 20

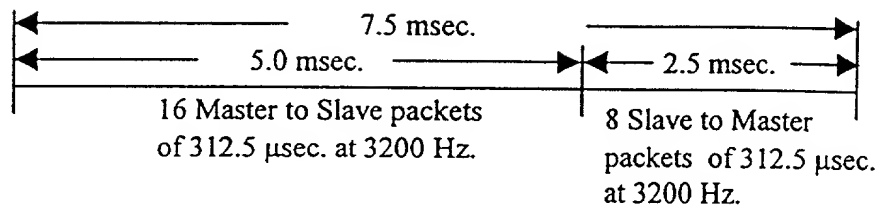


Figure 21

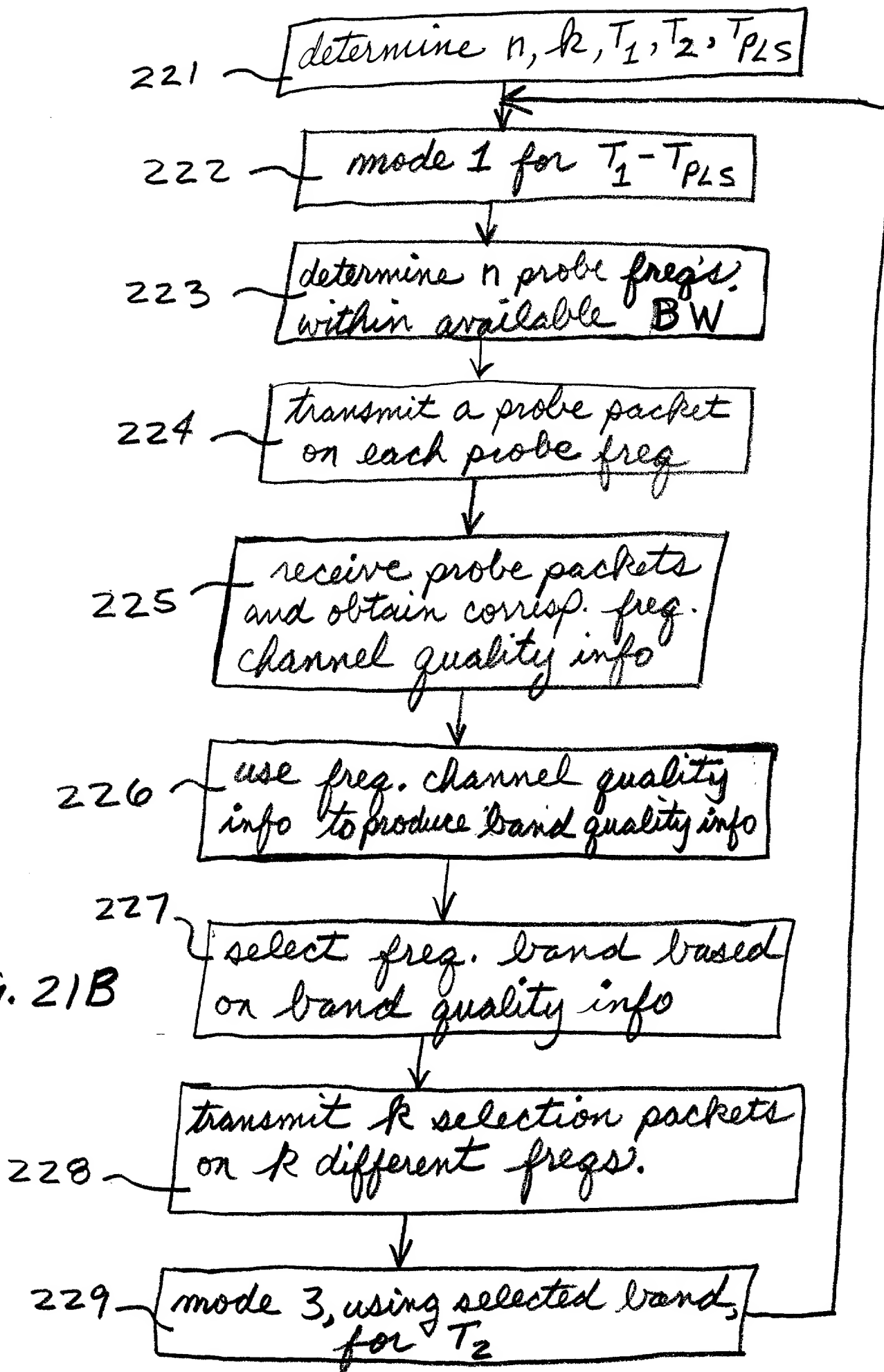


FIG. 21B

0977201-020501
T05020 T022260

| | | |
|--------------------|------------------------|---|
| Preamble 4 bits | Access Code 64 bits | Channel Edge Frequency Index $6 \times 3 = 18$ bits |
|--------------------|------------------------|---|

Figure 22

0977201-020504
005020-022460

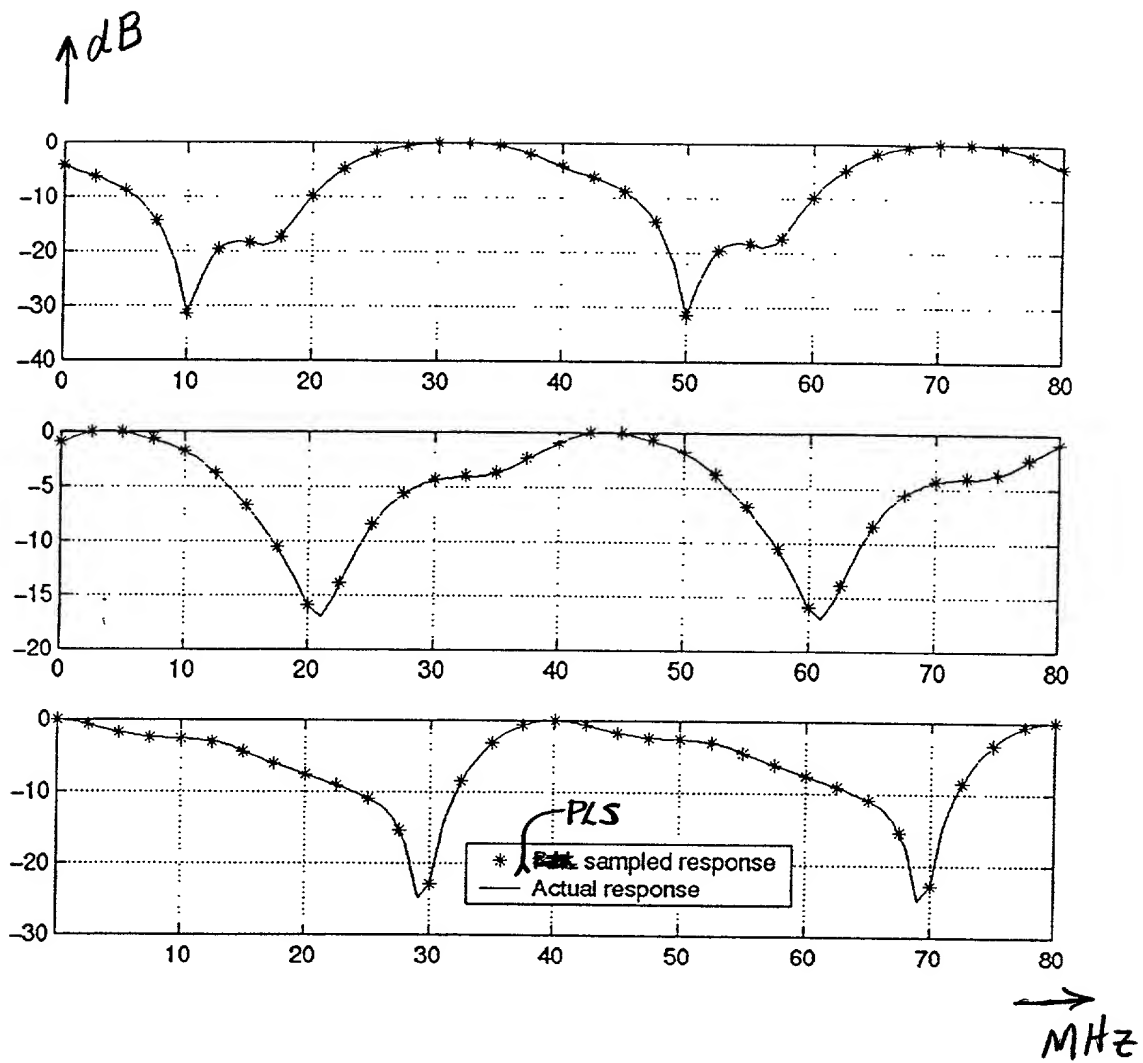
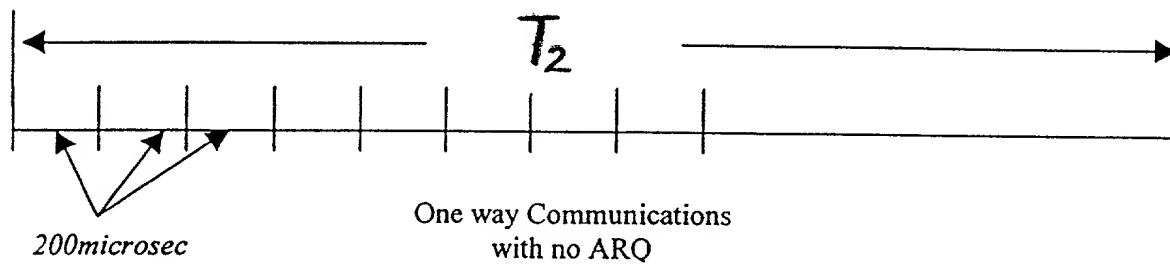


Figure 23

Master to Slave



ARQ Packets from Slave to Master
100 μ sec. in length.

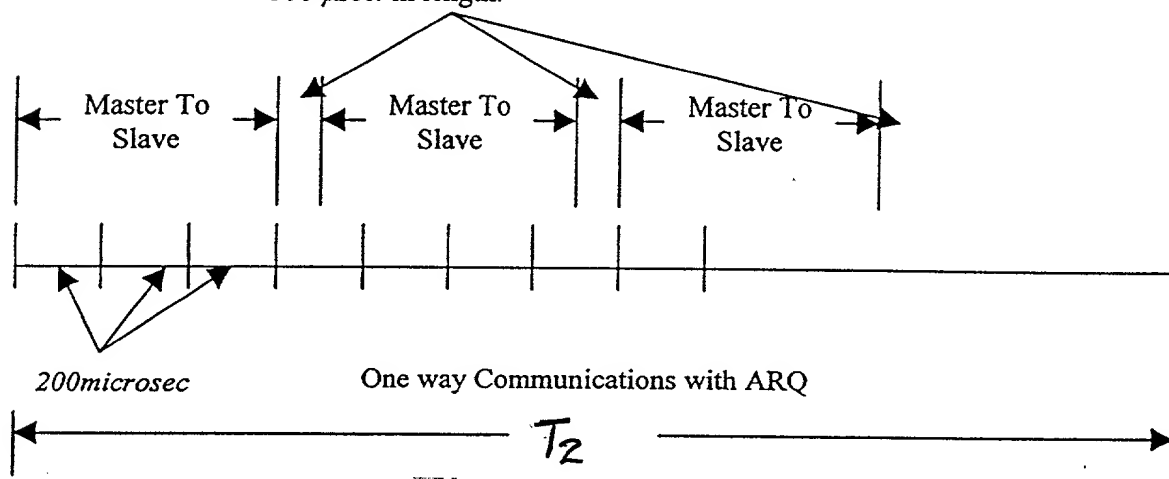


Figure 24

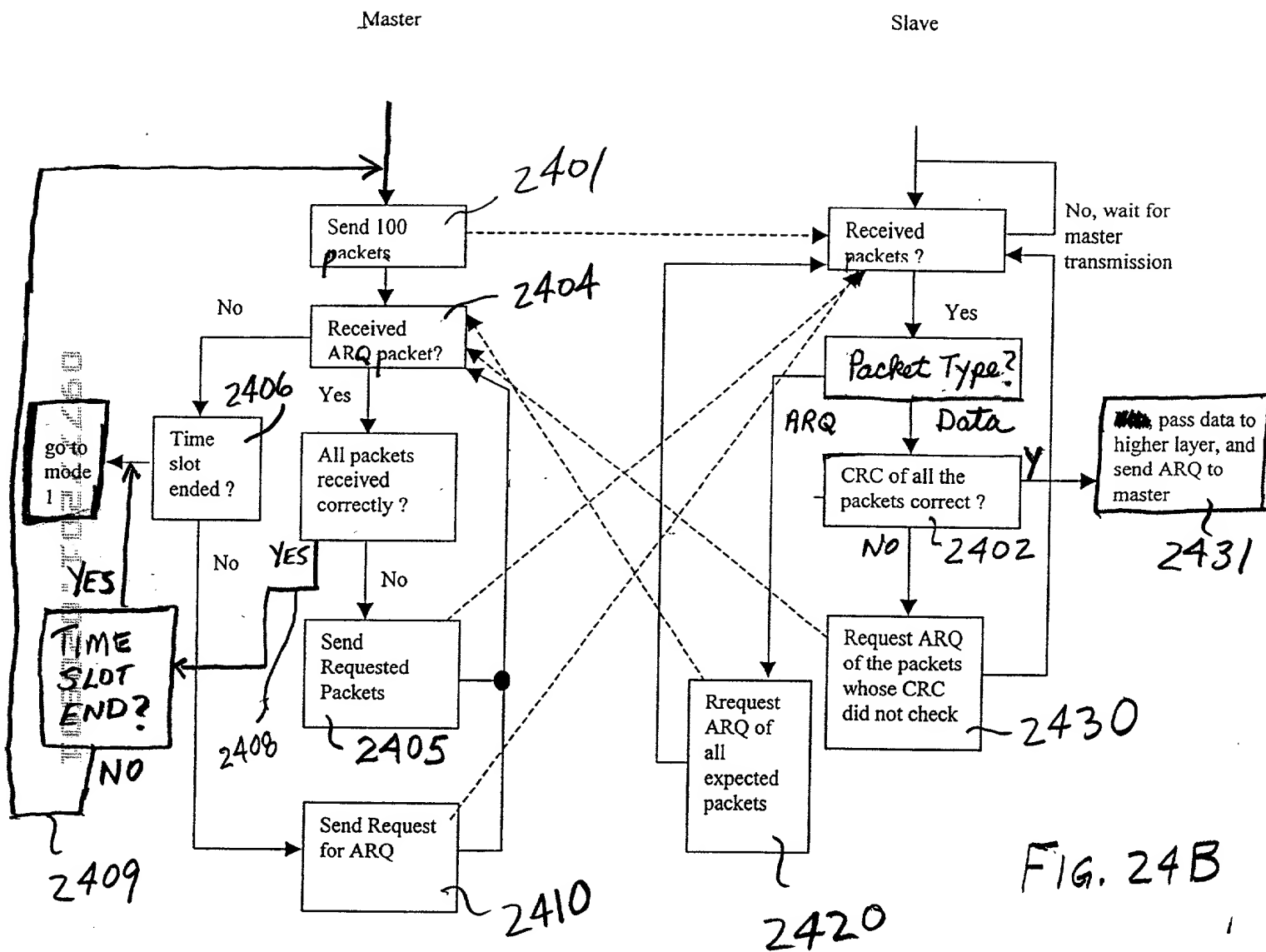


FIG. 24B

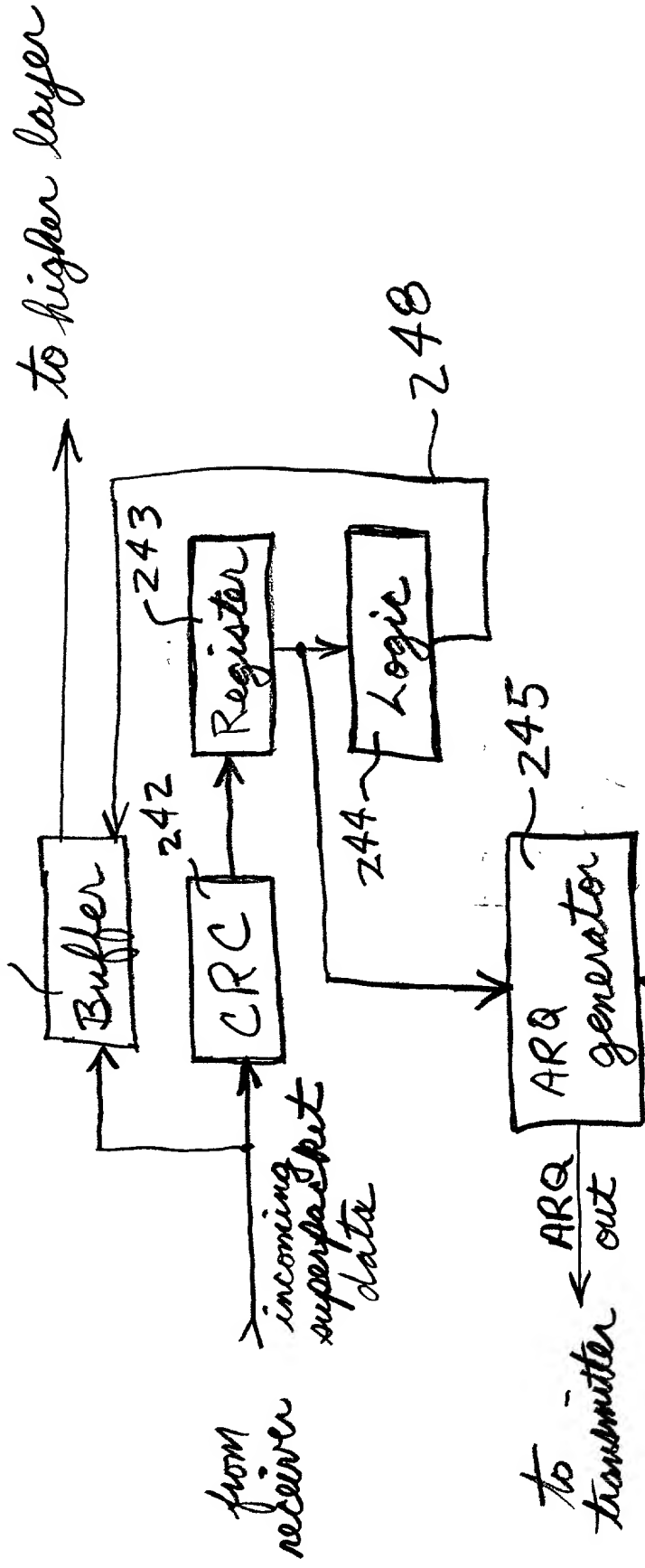
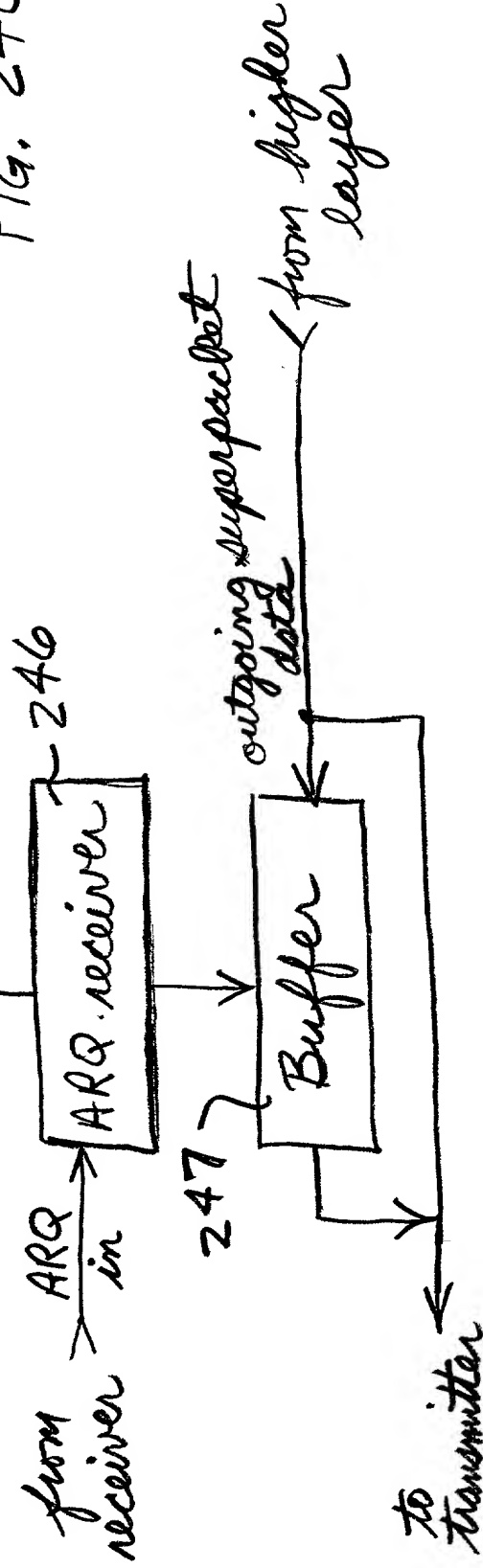


FIG. 24C



0977201.020501
T05020" T027750

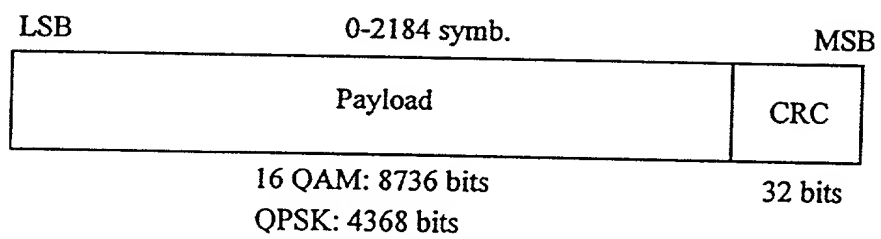


Figure 25

105020" 1022260

| | | |
|--------------|----------------|-----------------|
| 22 symb. | 32 symb. | 27 symb. |
| Preamble | Sync. Word | Header |
| 2 μ sec. | 2.9 μ sec. | 2.45 μ sec. |
| 44 bits | 64 bits | 54 bits |

Figure 26

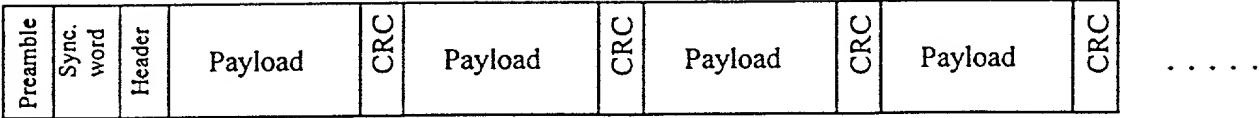


Figure 27

| MPEG2 HDTV Video transmission using Mode 3 | |
|---|-------------------------------------|
| Video data rate | 18 Mbps |
| Video frames/sec | 24 |
| Video frames/Mode 3 slot | 6 |
| Mode 3 data rate | 44 Mbps, 11 MSPS |
| Coding | Rate 1/2, Turbo |
| Modulation | 16 QAM |
| Time in Bluetooth mode (T_1 msec.) | 25 msec. |
| Time in Bluetooth mode for other devices | 17.5 msec. |
| Time in Bluetooth mode for PAL | 7.5 msec. |
| Slot time in Mode 3 (T_2 msec.) | 225 msec. |
| Mode 3 packet size | 4.4 Kbits |
| Data bits/packet | 4368 |
| CRC bits/packet | 32 |
| Mode 3 packet length | 200 μ sec. |
| Number of packets/slot | 1030 |
| Length of training sequence | 81 symbols, 7.36 μ sec. |
| Number of packets/training sequence | 10 |
| Number of packets/ARQ | 100 |
| Number of training sequences/packet | 103 |
| Time required to transmit video frames (no ARQ) | $204.5 + 1.5 + 0.76 = 206.76$ msec. |
| ARQ rate | 9 % |
| Time required to transmit video frames with ARQ | 225 msec. |

Figure 28

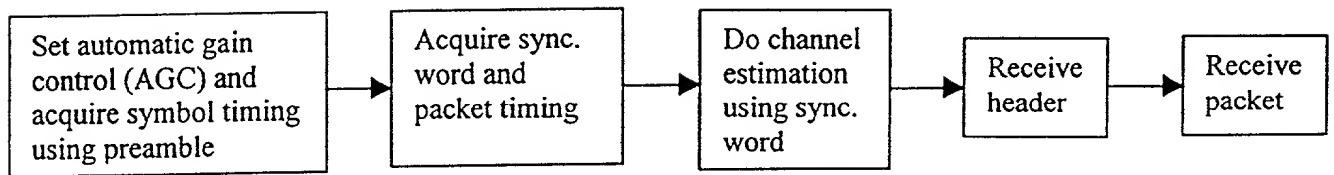


Figure 29

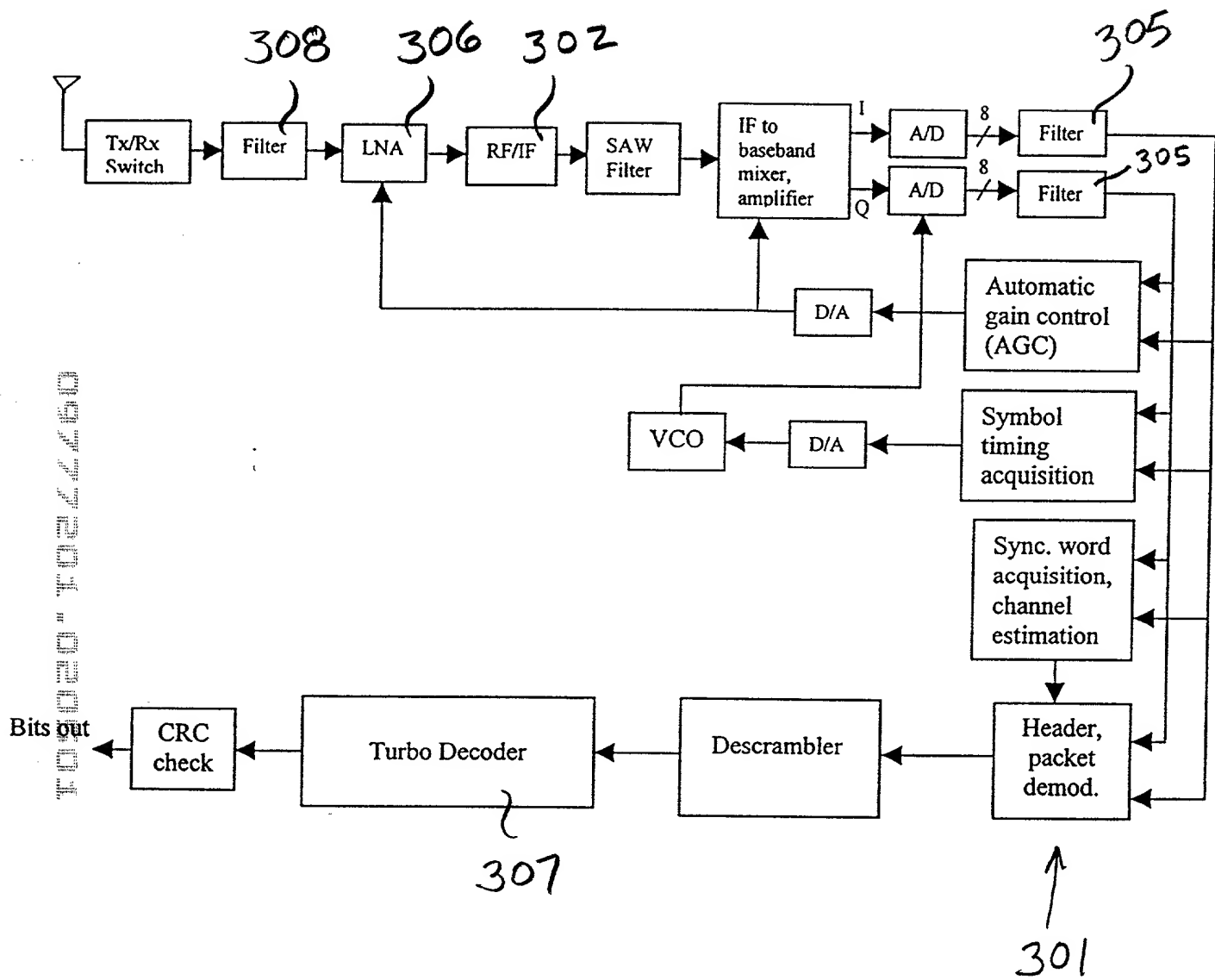


Figure 30

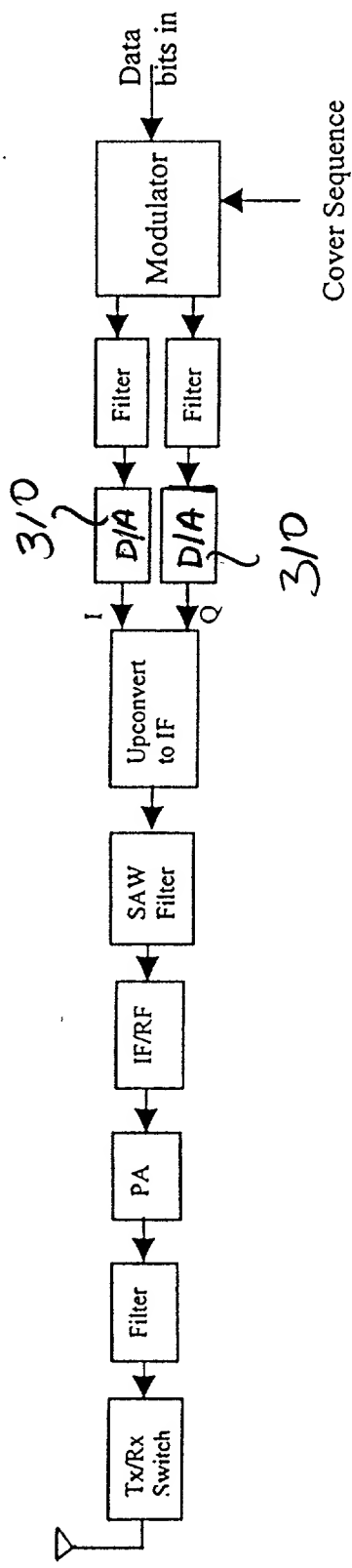


Figure 31

097724-020501

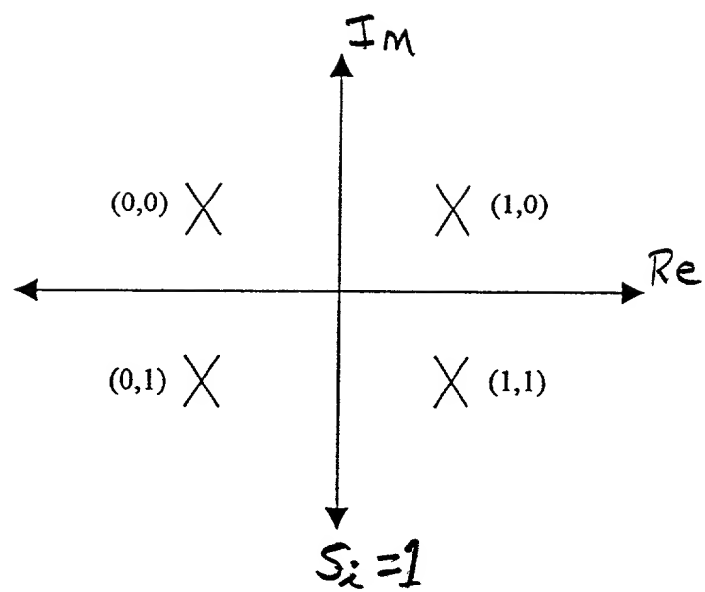
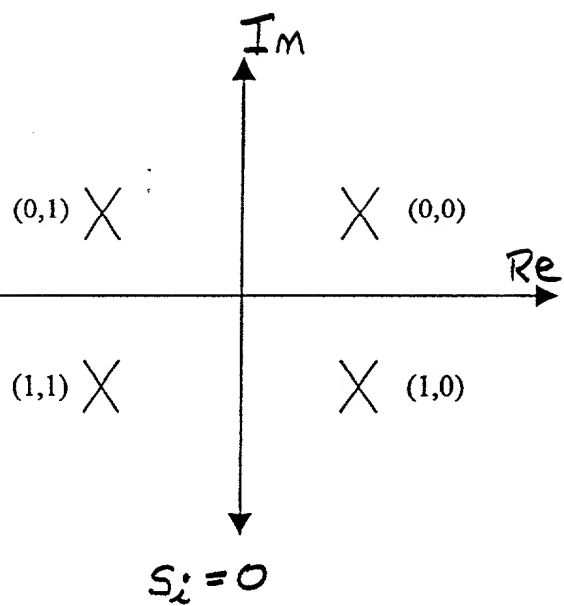


Figure 32

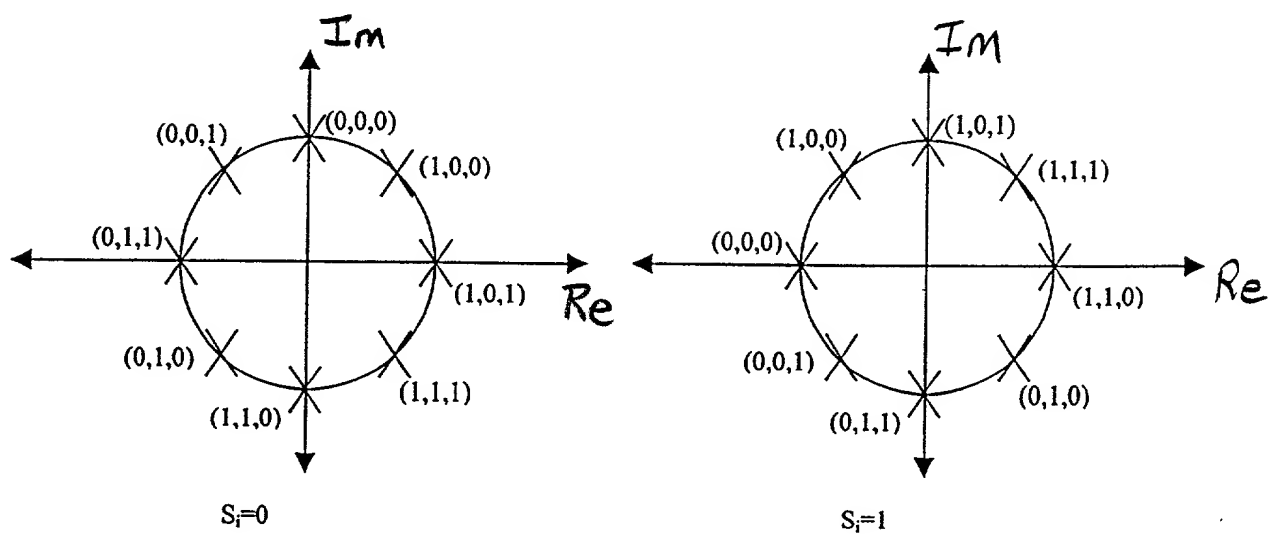


FIG. 32A

0977201-020501

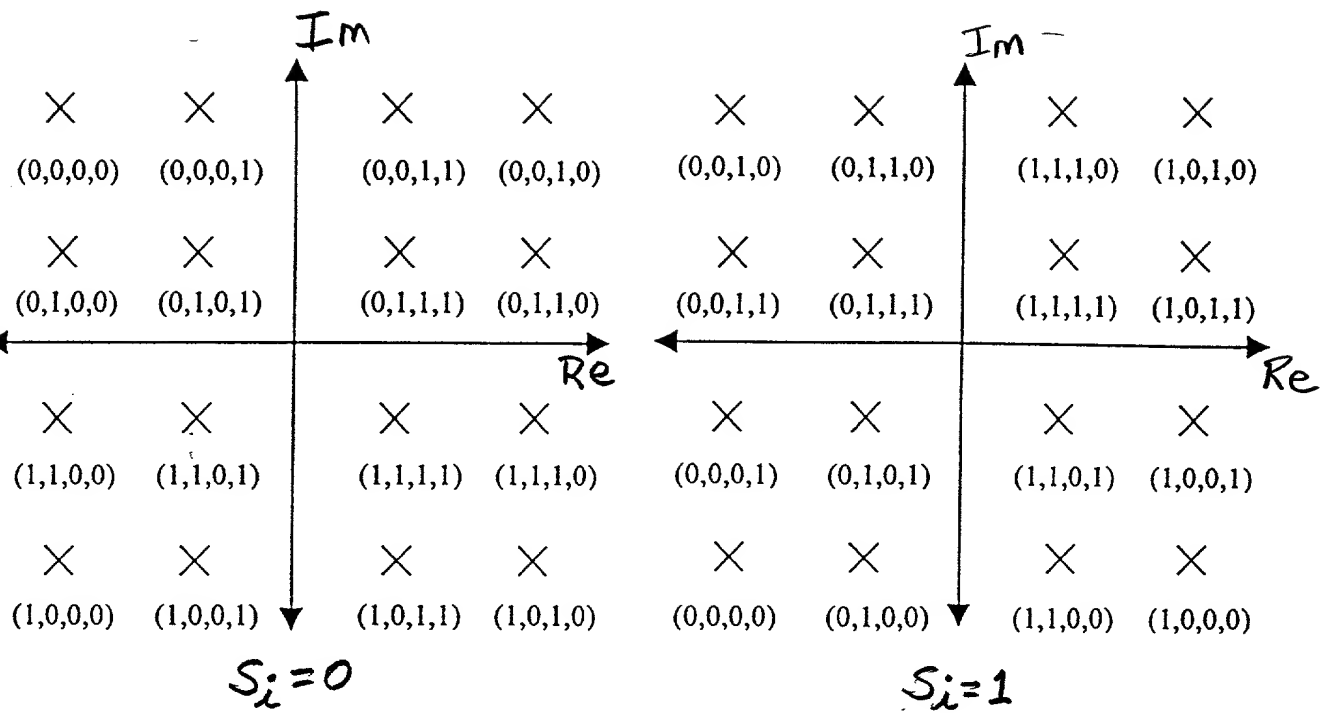


Figure 33

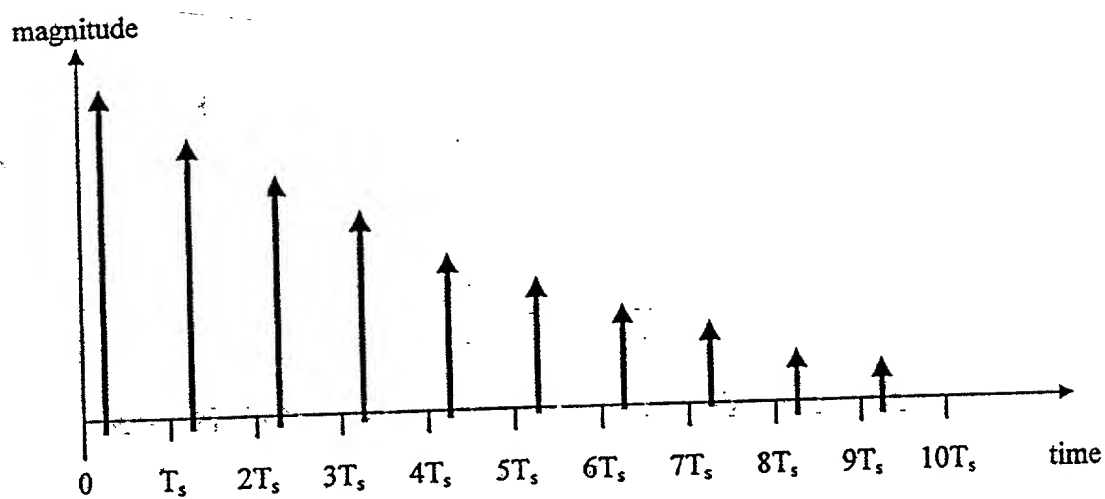


Figure 34

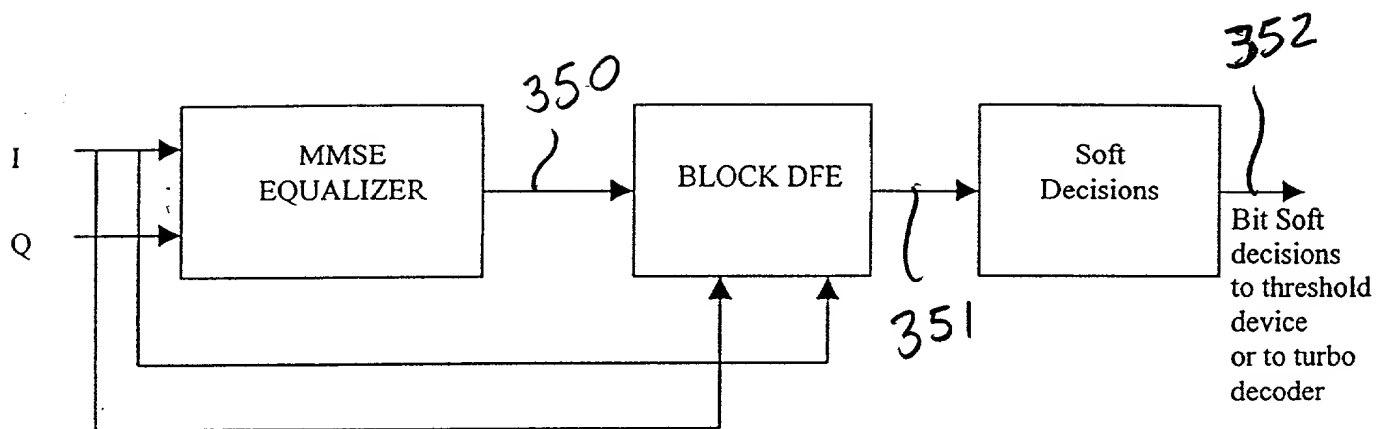


Figure 35

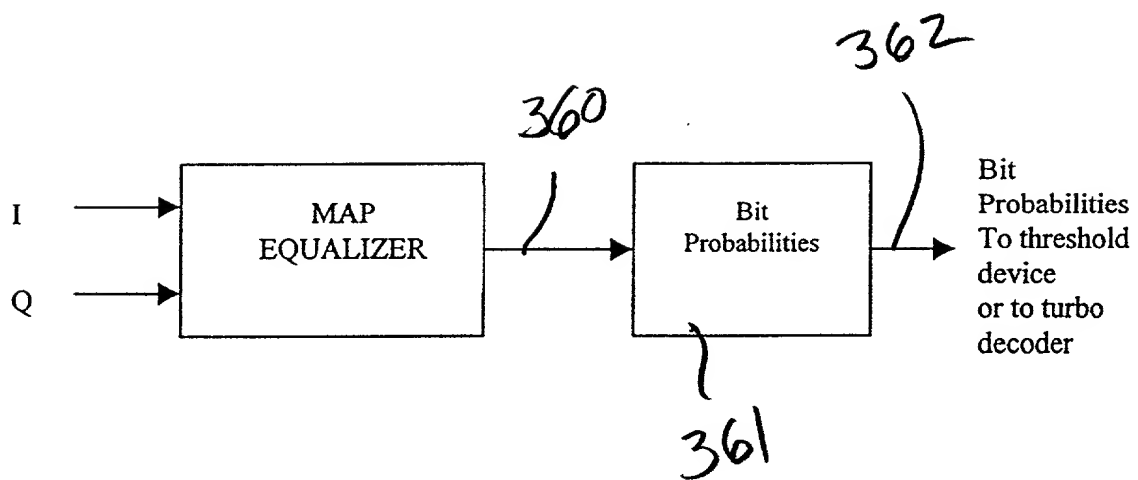


Figure 36

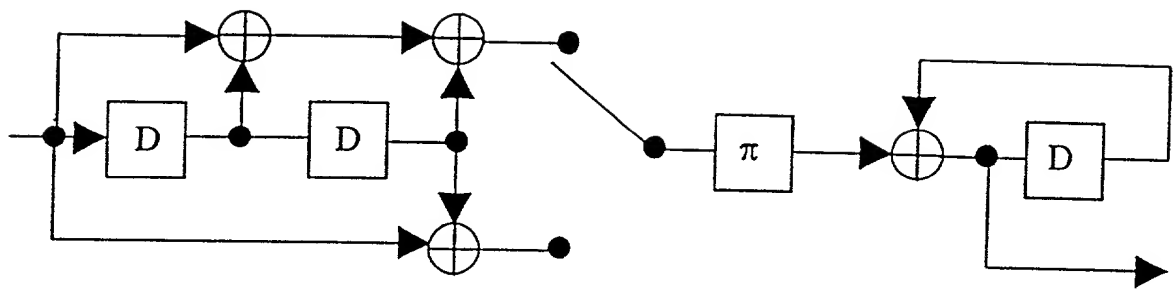


Figure 37

FOUO T02460

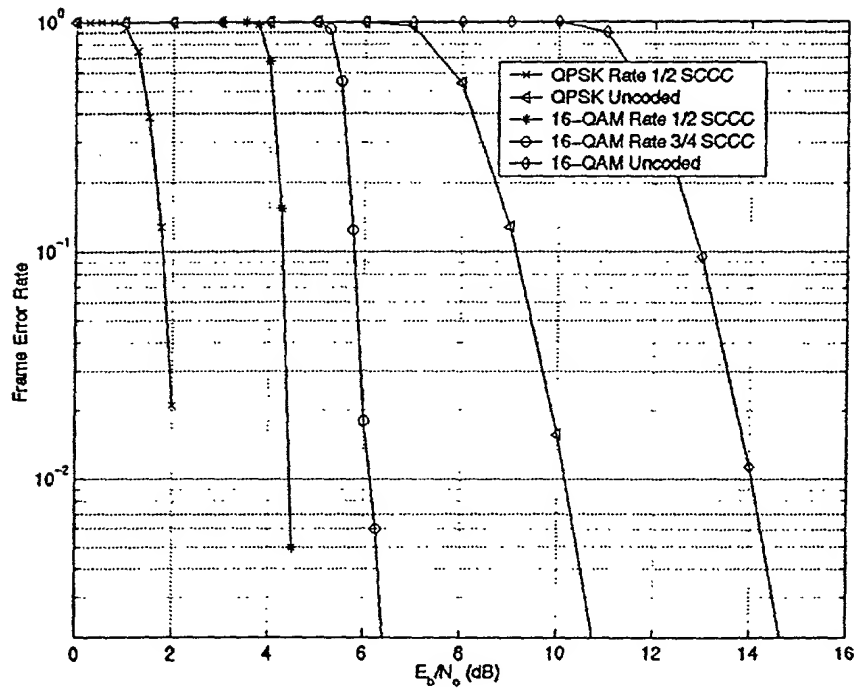


Figure 38

FOUO 7024260

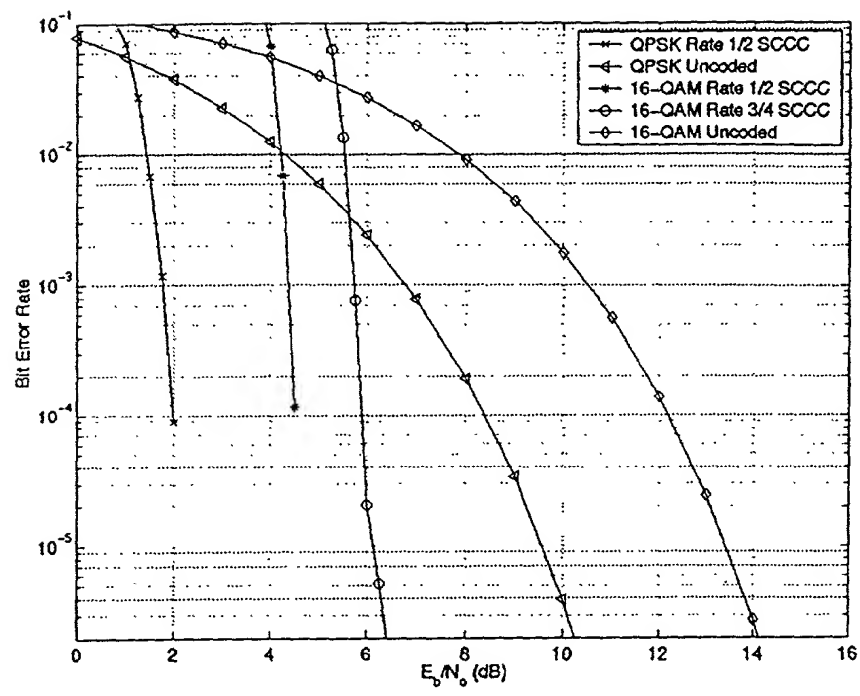


Figure 39

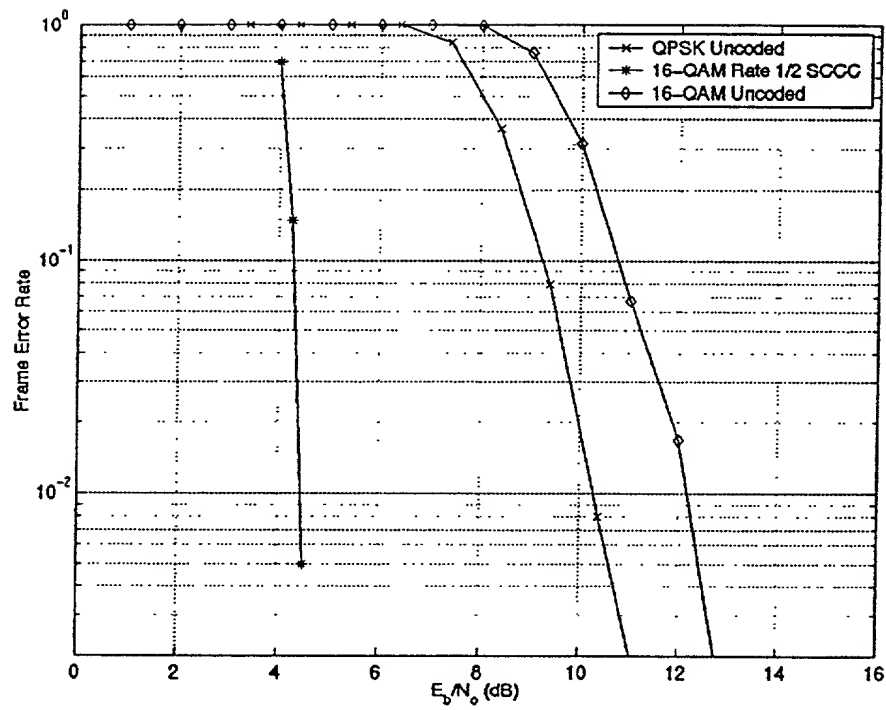


Figure 40

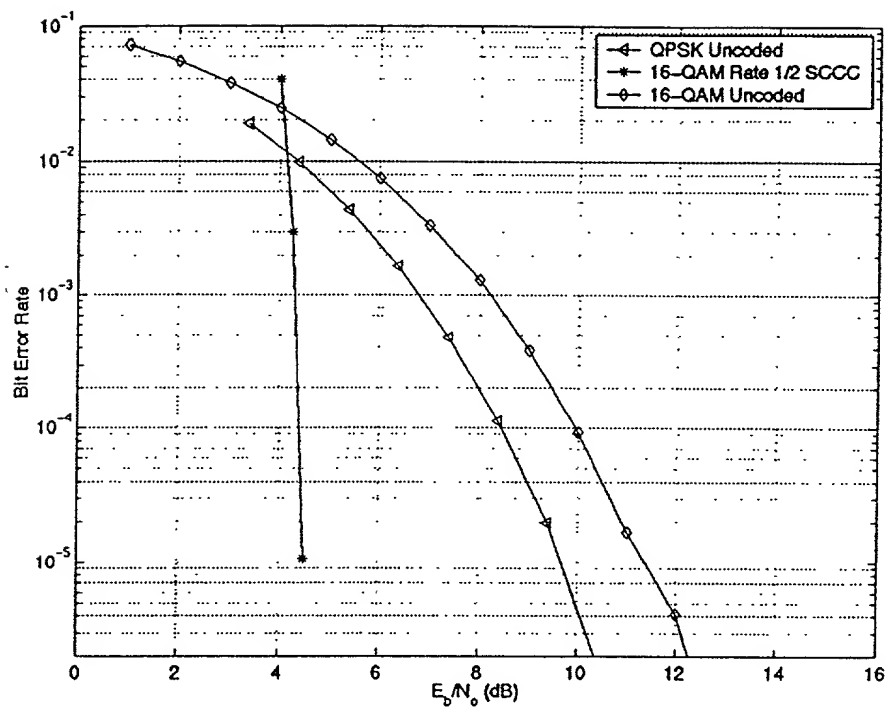


Figure 41

0977701 05020 1024460

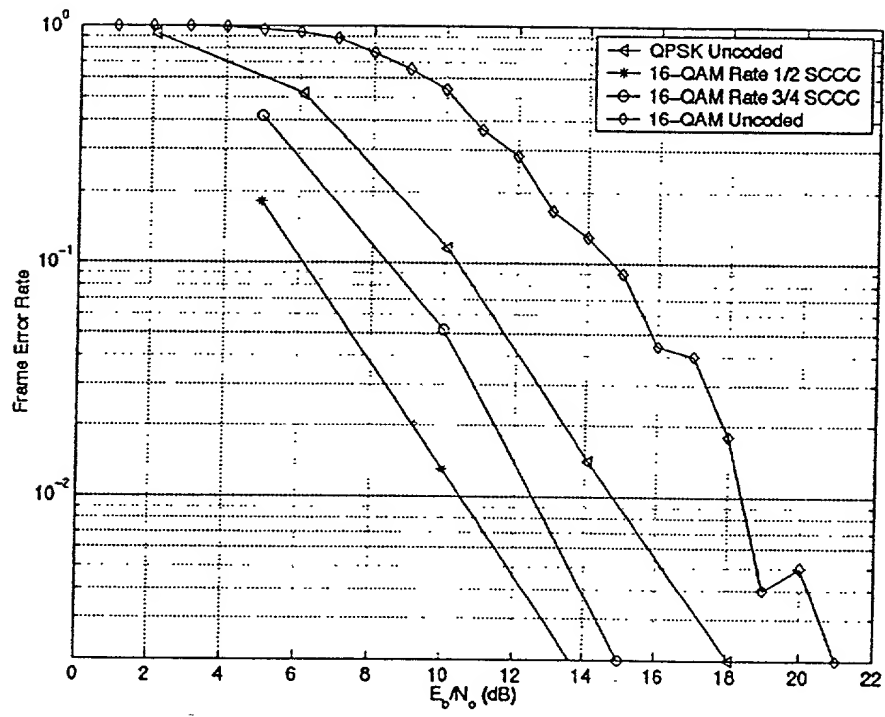


Figure 42

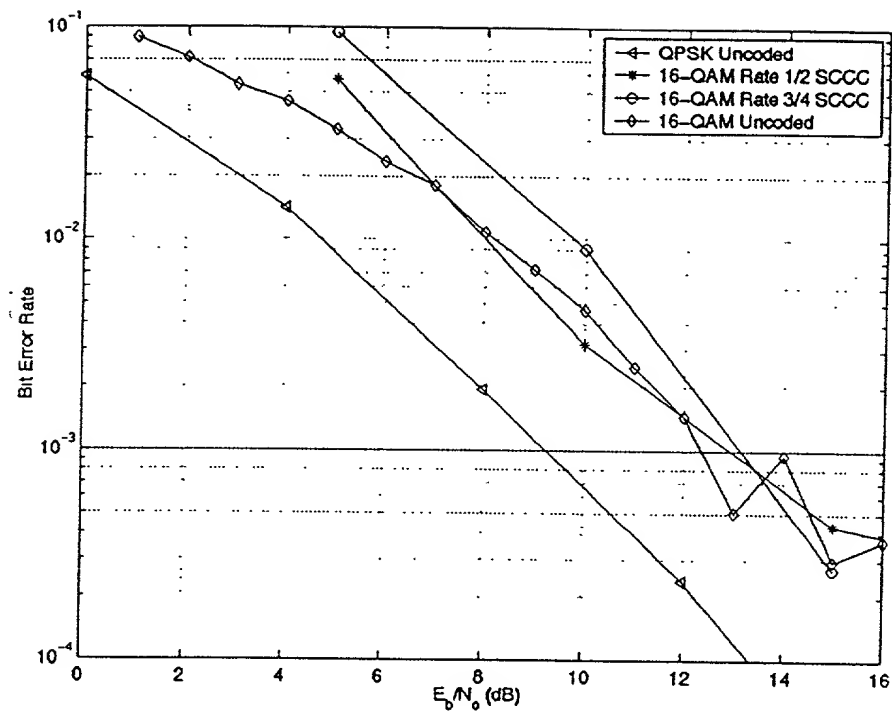


Figure 43

Figure 44

